



# SG2K5TL/SG3KTL/SG4KTL-31

PV Grid-Connected Inverter User Manual

## **About This Manual**

This manual is for the inverter SG2K5TL-31, SG3KTL-31 and SG4KTL-31. These inverters are grid-connected, transformer-less, robust and of high conversion efficiency. The device will bring you more profits from PV power system.

#### Aim

The manual contains information about the inverter, which will provide you guidelines to connect the inverter into the PV power system and operate the inverter.

#### **Related Documents**

The manual cannot include complete information about the PV system. You will get the additional information about other devices at www.sungrowpower.com/download or via webpage of device manufacturer.

#### **Target Group**

The manual is targeted to technical personnel who is responsible for inverter installation and commissioning in the PV power system and inverter owner who will perform daily LCD operation.

#### **How to Use This Manual**

Read this manual and other related documents before any work with the inverter. Documents must be stored carefully and available at all times.

The contents of the manual due to the product development will be periodically updated or revised. It is probably that there are changes of manual in subsequent inverter edition. The latest manual can be acquired via visiting the web page www.sungrowpower.com.

#### **Symbols Explanation**

Important instructions contained in this manual should be followed during installation, operation and maintenance of the inverter. And they will be highlighted by these symbols.



DANGER indicates a hazard with a high level of risk which, if not avoided, will result in death or serious injury.



WARNING indicates a hazard with a medium level of risk which, if not avoided, could result in death or serious injury.



CAUTION indicates a hazard with a low level of risk which, if not avoided, could result in minor or moderate injury.



NOTICE indicates a situation which, if not avoided, could result in equipment or property damage.



NOTE indicates additional information, emphasized contents or tips to help you solve problems or save time.

#### Symbols on the Inverter Body





This symbol indicates that you should wait at least 10 minutes after disconnecting the inverter from the utility grid and from the PV input before touching any inner live parts.



Hot surface! In order to reduce the risk of burns, do not touch device hot surface when the device is running.



Look over the user manual before any operation onto the inverter!



The installation and service of the inverter unit can only be performed by qualified personnel.



Do not disconnect DC connectors from the unit under load!

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# Safety Instructions

#### IMPORTANT SAFETY INSTRUCTIONS

#### SAVE THESE INSTRUCTIONS

Inverter SG2K5TL-31, SG3KTL-31 and SG4KTL-31 have been designed and tested strictly according to the international safety regulations. However, for electrical and electronic equipment, safety instructions related to electrical device must be complied with during installation, commissioning, operation and maintenance. Operation or work performed incorrectly may result in damage to:

- The life and well-being of the operator or a third party
- The inverter and other properties that belong to the operator or a third party

Therefore in order to reduce the risk of personal injury, inverter damage or other properties damage, the following general safety instructions must be read and always kept in mind prior to any work. All detailed work-related safety warnings and notes will be specified at the critical points in corresponding chapter.



All installation and electrical work must only be performed by qualified personnel. They have

- been trained specially;
- already completely read through and understood the manual and other related documents;
- been familiar with safety requirements for electrical system.

Technical personnel mentioned above may perform the following work:

#### SG2K5TL/SG3KTL/SG4KTL-31 User Manual

- Install the inverter onto the wall
- Connect inverter into the PV power system
- Connect other devices into the PV power system
- Commission the inverter
- Maintain and service the inverter

#### **Before Installation**



There is a risk of injury due to improperly handling the device!

- Always follow the instructions contained in the manual when moving and positioning the inverter.
- The weight of the equipment can cause injuries, serious wounds, or bruising if it is not handled correctly.

#### **During Installation**

Prior to installing the inverter onto the wall, it is crucial to make certain that the inverter is not electrically connected.



System performance loss due to bad ventilation!

The equipment requires good quality ventilation during operation. It is essential to keep the unit upright and nothing covering the heat sink in order to ensure that the equipment interior is well cooled down.

### **During Electrical Connection**



Lethal voltage exists!

PV arrays will produce electrical energy when exposed to sunlight and thus can create an electrical shock hazard.

- Wiring of the PV arrays should only be performed by qualified personnel.
- PV modules should be covered by opaque materials during wiring.



All cables must be firmly attached, undamaged, properly insulated and adequately dimensioned.

#### **During Inverter Operation**



There is a risk of inverter's damage or personal injury!

Do not disconnect DC connectors while the inverter is under AC load! First de-energize the equipment from dual power sources and verify that there is no voltage present.



There is a risk of burn!

Prevent from touching device hot parts (such as heat sink) during operation. Only LCD display panel and DC switch can be touched during inverter operation.

#### **Maintenance and Service**



- Any malfunction that may impair inverter safety functions must be repaired immediately before the inverter is restarted again.
- Inverter contains no owner serviceable parts inside. Please contact local authorized personnel if any service work is required.



Servicing of the device in accordance with the manual should never be undertaken in the absence of proper tools, test equipments and the more recent revision to the manual which is clearly and thoroughly understood.



There is a risk of inverter damage or personnel injury due to incorrect service work!

Always keep in mind that inverter is power supplied by dual power source: PV arrays and utility grid.

Before any service work, you should obey the following procedures.

- Disconnect inverter from the utility grid side first and then PV arrays;
- Wait at least ten minutes for inner capacitors discharge completely;
- Verify that no voltage and current present with appropriate testing device.



Keep non-related person away!

A temporary warning sign and barrier must be posted to keep non-related person away for any period while performing electrical connection and service work.

Do not open the enclosure when the inverter is under voltage. There is a highly unlikely risk of explosion in very specific cases of malfunction. The housing will protect persons and property from such an explosion, only if it is correctly sealed.



There is a risk of inverter damage if it is improperly serviced.

Use only accessories and spare parts approved by the inverter manufacturer. And never modify the inverter or other components of the inverter. Otherwise it will lead to loss of any and all warranty rights.



There is a risk of inverter damage due to electrostatic discharge!

The printed circuit boards contain components sensitive to electrostatic discharge. Wear a grounding wrist band when handling the boards. Do not touch the boards unnecessarily during replacement.

#### **Others**



The selected country settings can be changed by service personnel only!

Unauthorized access to country settings should be prohibited. Alternation of the country settings may cause a breach of the type-certificate marking.



All safety instructions, warning labels and nameplate on the inverter body:

- Must be clearly visible;
- Must not be removed, covered and pasted.



These regulations should also be followed:

- The regulations related to the electricity fed into grid;
- The safety instructions related to PV arrays;
- The safety instructions related to other electrical device.

## **Product Introduction**

## 2.1 Intended Usage

SG2K5TL-31, SG3KTL-31 and SG4KTL-31(They will be referred to as inverter hereinafter unless otherwise specified), single-phase without transformer string inverters, are crucial units between the PV arrays and utility grid in the small-scaled PV power system.

Inverter is dedicated to converting direct current power generated by the PV modules into alternating current, which conforms to parameters of local utility grid, and feeds the alternating current into the utility grid. An example about intended usage of the inverter is show in Fig 2-1.



Where the positive or negative terminal of PV strings needs to be grounded, inverter cannot be connected to PV modules of this type.

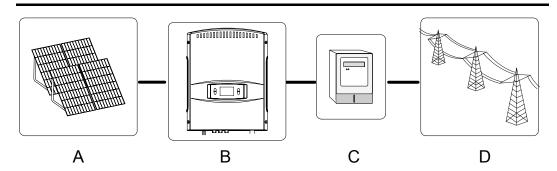


Fig 2-1 Inverter Applied in the PV Power System

Item	Description	Remark
Α	PV strings	monocrystalline silicon; polycrystalline silicon and thin-film without grounding of protection class II
В	Inverter	SG2K5TL-31, SG3KTL-31 or SG4KTL-31 involved
С	Metering device	meter cupboard with power distribution system
D	Utility grid	TT, TN



Any other or additional usage is not permitted except the intended usage.

Inverter may only accept PV modules of Protection Class II as its input.

Inverter may only be connected to utility grid via distribution board. Local loads (home appliance, lights, motor loads, etc.) can not connected between inverter and AC circuit breaker on the distribution board.

Additionally, the unit is intended for fixed installation. Located on a part that is not removable without impairing the operation of the unit.

## 2.2 Product Description

### 2.2.1 Product Appearance

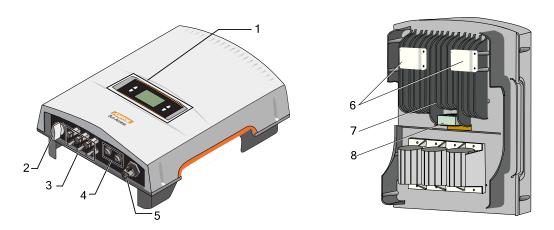


Fig 2-2 Product Components Description

Item	Name	Description
1	LCD display panel	Inverter operation data viewing and parameters configuration can be performed on the LCD display panel.

Item	Name	Description
2	DC switch	Optional component. It is designed for safely disconnecting DC current.
3	DC terminals	There are three pairs of DC terminals between PV arrays and inverter.
4	RS485 terminals	Standard communication interface.
5	AC terminal	Inverter feeds power to utility grid via this terminal.
6	Mounting ear	It is used for hanging inverter onto the backplate.
7	Heat sink	It is used for cooling down the unit temperature during operation.
8	Fan	Only SG4KTL-31 is equipped with fan to help air ventilation.

## 2.2.2 Dimensions and Weight of Inverter

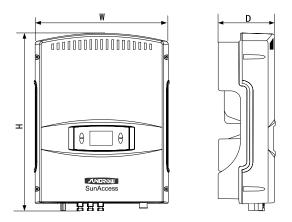


Fig 2-3 Dimensions of Inverter

Table 2-1 Dimensions Value

Туре	W(mm)	H(mm)	D(mm)	Net weight(kg)
SG2K5TL-31	420	555	179	20
SG3KTL-31	420	555	179	20
SG4KTL-31	420	555	179	20

## 2.2.3 LCD Display Panel

As a friendly human-computer interaction interface, LCD display panel comprises LED indicators, buttons and LCD display screen on inverter front panel.

- LEDs indicate the working status of the inverter
- The current running information shown on the LCD display

- Malfunction records shown on the LCD display
- Inverter configuration by pressing the buttons

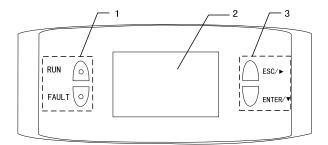


Fig 2-4 LCD Display Panel

No.	Name	Description
1	LED indicators	"RUN" and "FAULT". Inverter working status can be known from the two indicators. Detailed definition is shown in Table 2-2.
2	LCD Screen	LCD screen can display the current state of inverter, current running information, history information and parameters to be set.
3	Buttons	Navigate in the LCD menu, select values and so on. Detailed functions are shown in Table 10-1.

Table 2-2 Description of LED Indicator

LED State	Description
"RUN": on	Inverter is feeding AC power to the utility grid.
"FAULT": off	
"RUN": off	A malfunction happens;
"FAULT": on	Or a protection function is activated.
"RUN": off	Inverter is not energized;
"FAULT": off	There is communication error between DSP and LCD.

#### 2.2.4 DC Switch

DC switch is designed for safely disconnecting the DC current if required.

The inverter works automatically when input and output meet the requirements. If you want to interrupt its running or if a malfunction occurs, rotate DC switch to the "OFF" position to stop inverter from running.



Before restarting the inverter, rotate the DC switch to the "ON" position.

### 2.3 Technical Description

#### 2.3.1 Principle Description

The principle design of transformer-less and grid-connected inverter can be known from the block diagram Fig 2-5. Three PV strings input voltage is transmitted to DC BUS via Boost circuit. And then a full bridge circuit converts it into sinusoidal current. The AC connection to the local utility grid is via 3 wires for a single phase feed point. There is a MPP tracker to ensure that maximum power from PV string can be utilized. Inside the inverter protective circuit to can trigger AC relay if required for guaranteeing inverter safely operation and person.

Standard interface RS485 are provided for communication with other devices. You can look up inverter running status and configure parameters by navigating LCD display panel menu.

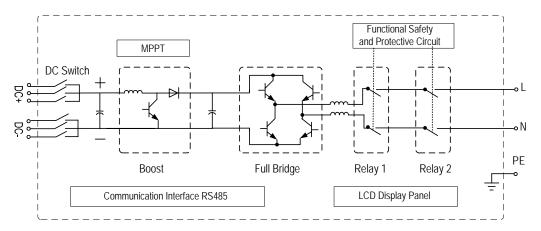


Fig 2-5 Main Circuit Diagram of Inverter

## 2.3.2 Functions Description

Inverter functions can be grouped as the following:

- Conversion function
  - Inverter converts the direct current power into alternating current power, which conforms to the grid requirement of its installation country.
- Data storage and display

Inverter stores essential data including running information and fault records, and displays them on integrated LCD display.

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Parameters configuration

Inverter provides various parameters configuration for optimal operation.

Communication interface

Standard RS485 interface for connecting other monitoring devices into the PV system is included.

- Protection functions include
  - reverse polarity protection
  - short circuit protection
  - insulation resistance to ground surveillance
  - inverter output voltage surveillance
  - inverter output frequency surveillance
  - residual current protection
  - DC component of AC output current surveillance
  - anti-islanding phenomena protection
  - ambient temperature surveillance

# Workflow about Inverter

The following diagram shows the installation flow of inverter for installer. Please follow these procedures.

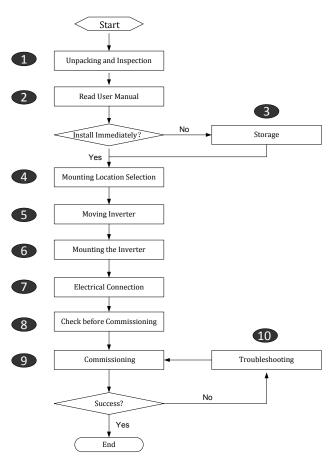


Fig 3-1 Installation Flow Chart

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Table 3-1 Description of Installation Flow

Order	Description	Remark
1	Unpacking and inspection	Section 4.1
2	Read this manual, especially the section on "safety instruction"	Chapter 1
3	Store the inverter unit if not installed immediately	Section 4.4
4	Choose the best installation site	Section 5.1
5	Moving the inverter to installation site	Section 5.2
6	Install the inverter against the chosen wall	Section 5.3
7	Electrical connections include DC, AC, ground and communication(optional)connection	Section 6.3~6.6
8	Examine before commissioning	Section 7.1
9	Start up inverter and configure corresponding parameters	Section 7.2
10	Troubleshooting	Section 9.1

# Unpacking and Storage

## 4.1 Unpacking and Inspection

The unit is thoroughly tested and inspected strictly before delivery. Although sturdy packaging is used, damage may still occur during shipping.

- Check the packing for any visible damage upon receiving.
- Check the inner contents for damage after unpacking.
- Check the completeness of delivery contents according to the supplied packing list.

If there is visible damage to the packaging or the inner contents, or if there is something missing, contact the unit dealer.

Do not dispose of the original packaging. It is the best choice to store the inverter by re-using the original packaging.

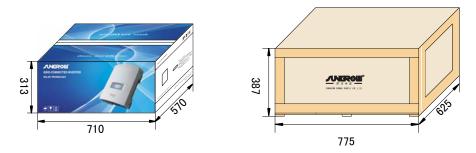


Fig 4-1 Single Inverter in Original Carton and Wooden Crate (unit:mm)

## 4.2 Identifying Inverter

A nameplate is attached to one side of the inverter and the carton respectively. It provides information on type of inverter, along with the most important specifications, marks of certification institutions, website and serial number which is available and identified by Sungrow.



Fig 4-2 Nameplate of Inverter SG4KTL-31(without serial number)

\*Image shown here is indicative only. Actual product you receive may differ.

Item	Description
1	SUNGROW logo and product type
2	Technical data of inverter
3	Marks of certification institutions of inverter
4	Company name, website and origin

Table 4-1 Description of Icons on the Nameplate

Icon	Description
<u>\$</u>	Don't dispose of the inverter with the household waste.
Ţ <u>i</u>	Refer to the corresponding instructions.
SUD SUD	TUV mark of conformity.  The inverter is in compliance with directives of TUV.
C€	CE mark of conformity.  The inverter is in compliance with directives of CE.

# 4.3 Delivery Contents

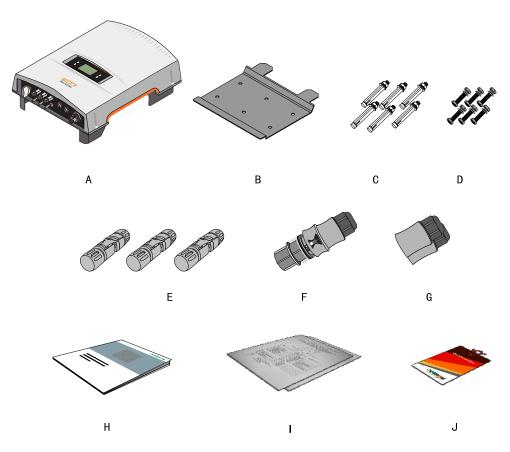


Fig 4-3 Delivery Contents

Item	Description	
A	Inverter unit	
В	Backplate is used for mounting inverter onto the wall	
С	Expansion bolts for fastening backplate onto concrete wall	
D	Fastener set for installing inverter onto metal frame	
E	PV input connectors, including positive and negative connectors	
F	AC output connector	
G	Waterproof Ethernet male-connector	
Н	User Manual, including installation instructions and operation instructions	
1	Packing list and product test report	
J	Quality certificate	

## 4.4 Storage of Inverter

Where the inverter may not be installed immediately or inverter needs to be stored under certain condition, store the unit as the following indications:

- The unit must be packed into original carton and desiccant must be left inside. If the original packaging is not accessible, an equivalent carbon which is able to support the unit weight and size can be used.
- The packing should be sealed by adhesive tape.
- The unit must be stored in a clean and dry place to protect against dust and moisture.
- The storage temperature should be always between -25 °C ~60 °C. And the storage relative humidity should be always between 0 and 95%.
- It is very important to keep the packing away from chemicals. Otherwise it will lead to corrosion.
- During the storage time, periodically check any visible damage by rats and other rodents. Replace the packaging if necessary.
- The packaging should be kept upright.
- If there is more than one inverter to be stored, the maximum layers for original carton is three.
- After long term storage, local installer or service dept. of Sungrow should perform a comprehensive test before connecting the inverter into PV power system.

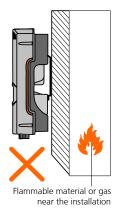
# Installing Inverter onto Wall

Installation shall comply with local regulations and technical rules. Installation shall comply with the relevant instructions of AS 4777.1.

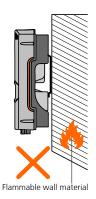
### 5.1 Selecting Installation Location

Selecting an optimal installation location for the inverter is decisive for its operating safety as well as it expected efficiency and service life.

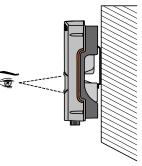
- 1. Take the load capacity of the wall into account. The wall (such as concrete wall and metal structure) should be strong enough to hold the weight of the inverter over a long period of time.
- 2. Install the unit where is accessible to install, electrical connection or service.
- 3. Do not install the inverter where contains flammable materials or flammable gas in the vicinity of the unit installation.



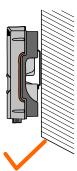
4. Do not install the unit on wall of flammable materials.



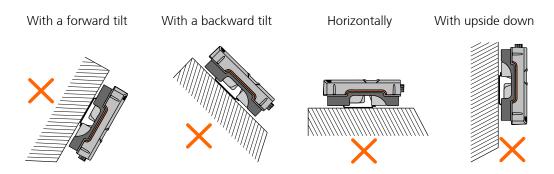
5. Install the unit at eye level for easily buttons operation and display read.



6. It is suggested that the inverter be installed vertically with upside up for good heat dissipation.

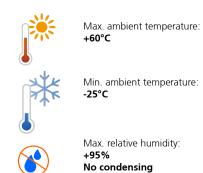


7. Never install the inverter horizontally, or with a forward tilt, or with a backward tilt or even with upside down.

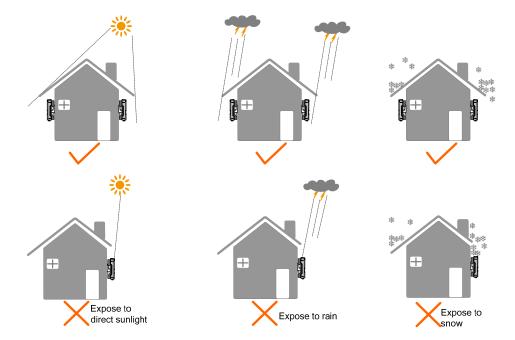


8. The inverter unit with IP65 can be installed indoors or outdoors also.

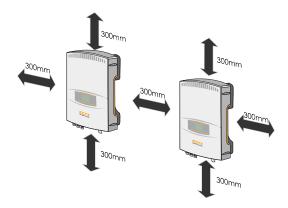
- 9. The ambient temperature should range from -25°C to 60°C. When ambient temperature exceeds 45°C, the power output will reduce.
- 10. The relative humidity of chosen installation site should never exceed 95%. Moisture may result in corrosion and damage to the inner electronic components.



11. Do not expose the inverter to the direct sunlight. Otherwise inverter will not operate normally. Meanwhile avoid exposing to rain or snow to extend its service life despite of IP65 protection degree. Shaded site of the building will be better.



12. Take enough space for convection into consideration during installing multiple inverters.



13. Do not install the inverter in a closed cabinet. Otherwise, the inverter will not operate normally.



- 14. Do not install inverter where children can reach.
- 15. Do not install inverter in living area. Noise can be produced during running of inverter, which may affect your daily life.

### 5.2 Moving Inverter to Installation Site

If the inverter is to be installed, remove the unit from the packaging and move it to the chosen installation site. During the moving process the instructions below should be obeyed.

- 1. Remember the weight of inverter.
- 2. Grasp the equipment with both hands by means of handles.
- 3. Do not release the equipment unless it has been secured to the wall firmly.

### 5.3 Installation Procedure

Inverter is installed onto the wall by means of backplate in the packaging. If you don't use the supplied backplate, you can drill holes refer to its dimension below.

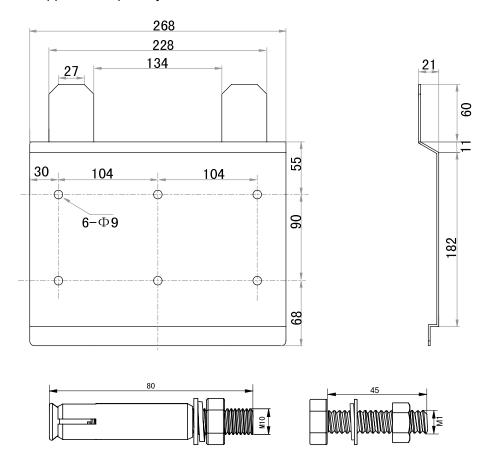


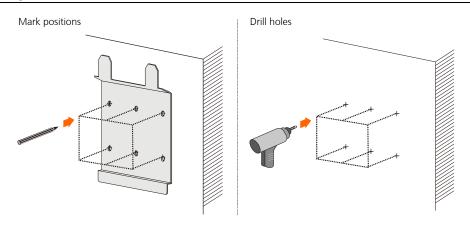
Fig 5-1 Dimensions of Backplate and Fastener(unit: mm)

In the following pages we will introduce how to install the inverter onto the wall using the provided backplate.

#### **Concrete Wall**

- 1. Remove backplate and expansion bolts from the packaging.
- 2. Place the backplate onto the chosen concrete wall and adjust it until it is in a horizontal position.
- 3. Mark the positions to drill holes using the backplate as the template.
- 4. Drill holes according to the marks you have made.

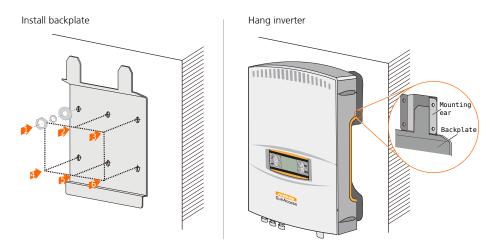
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In order to avoid electrical shock or other injury, inspect existing electronic or plumbing installations before drilling holes.

- 5. Attach the backplate to the wall with the supplied expansion bolt set. The torque for fastening the nut should be at least 35 Nm.
- 6. Lift up the inverter above the backplate and then slide down, making sure that the two mounting ears on the back of the inverter and counterparts of the backplate engage perfectly.



## **Electrical Connection**

Once the inverter is firmly attached to the appropriate location, it can be connected into the PV power system.



Improper operation during the wiring process can cause fatal injury to the operator or unrecoverable inverter damage. Only qualified personnel can perform the wiring work.

Prior to any electrical connection, keep in mind that inverter has dual power supplies. It is mandatory for technical personnel to wear personal protective equipments: helmet, footwear and gloves during the electrical work.

### **6.1** Terminals Description

All electrical terminals are located at the bottom of unit, as the following diagram shown. Sungrow provides corresponding plug connectors in the scope of delivery, as a result of convenient and safe connection without opening the lid.

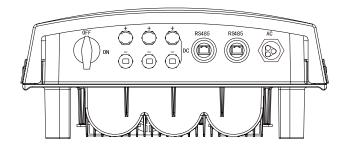


Fig 6-1 Terminals Description

## 6.2 Simplified Electrical Connection Diagram

Connecting inverter to the existing PV system includes inverter connection to local grid and inverter connection to PV arrays. There may be communication connection to be established for monitoring inverter operation if necessary.

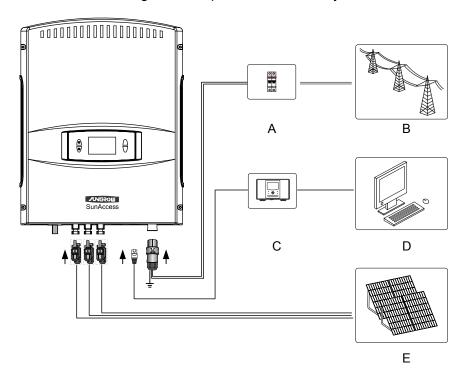


Fig 6-2 Electrical Connection Diagram

Item	Description	Remark
A	AC circuit breaker	Used as a protective device during electrical connection. User equips this device according to maximum output voltage and current.
В	Utility grid	Rated grid voltage is 230V.
С	SolarInfo logger or converter device	User may order it from Sungrow.
D	PC	User equips this device to monitor inverter.
E	PV arrays	There are three pairs of input terminals for inverter. The allowable maximum open-circuit voltage for each PV string is 500V.

# 6.3 Connecting Inverter to AC Grid

#### 6.3.1 AC Side Requirements



Only after receiving prior approval from the local grid company as required, should you connect the inverter to the grid.

Prior to connecting to the utility grid, verify whether the grid voltage and frequency are within the range of inverter output parameters, referred to "Appendix". Otherwise consult local grid company for solution.

#### AC Side Circuit Breaker

An independent two-pole circuit breaker for each inverter must be installed at the output side to ensure that the inverter can be securely disconnected under load.

Inverter Type	Specification Recommended of AC Circuit Breaker
SG2K5TL-31	20A
SG3KTL-31	25A
SG4KTL-31	32A



There are some points that are not allowed for the inverter:

- It is not allowed for several inverters to use the same circuit breaker.
- It is not allowed to connect loads between inverter and circuit breaker.

#### **Residual Current Device**

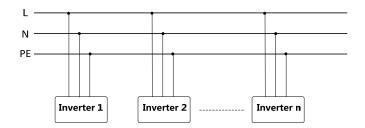
With an integrated universal current-sensitive residual current monitoring unit inside, the inverter is able to distinguish the fault currents from normal capacitive leakage currents. The inverter will disconnect immediately from mains as soon as a fault current of more than limit value has been detected.

However if an external RCD or residual current breaker is mandatory, the switch must trigger at a failure current of 100mA or higher.

## Requirements of Inverter Parallel Grid Connection

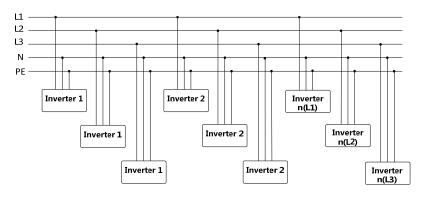
If several inverters are operated in parallel connection to grid, there are different requirements according to different scenarios.

**Scenario 1:** Several inverters are operated in parallel connection to the single-phase Low Voltage grid.



Requirements: The sum of all inverters in parallel connection is limited to THIRTY.

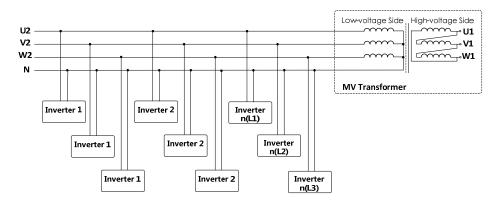
**Scenario 2:** Several inverters are operated in parallel connection to the three-phase Low Voltage grid.



#### Requirements:

- The sum of all inverters in parallel connection is limited to thirty.
   n(L1)+n(L2)+n(L3)≤30.
- Inverters should be distributed as equally as possible between the three phases with maximum unbalanced load of 4.6kVA.

**Scenario 3:** Several inverters are operated in parallel connection to low-voltage side of MV transformer. The high-voltage side of MV transformer is connected to the Middle Voltage Grid.



#### Requirements:

- The sum of all inverters in parallel connection is limited to thirty.  $n(L1)+n(L2)+n(L3)\leq 30$ .
- Inverters should be distributed as equally as possible between the three phases at the low-voltage side with maximum unbalanced load of 4.6kVA.
- The rate voltage on the low-voltage side of transformer must meet the inverter output electrical specification. A neutral point is necessary and must lead outwards as neutral conductor.



As mentioned above in the three scenarios, the total number of inverters is always less than or equal to **THIRTY**. If there are inverters more than the limited value, Inverters may not operate normally.

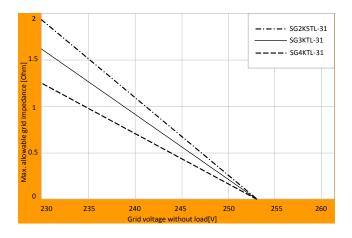
#### 6.3.2 Assembling AC Connector with Cables

The grid connection of inverter is made via 3 wires (L, N, and PE). And feeding power is always single-phase via AC terminal at the bottom of the unit.

#### **AC Cable Requirements**

Select AC cable specifications and type considering the following facts:

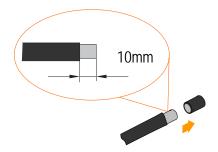
1. The grid impedance of the AC cable must correspond to the specification to avoid unintended disconnection from the grid or derating of the output power.



- 2. Cross section of AC cables should be selected, considering power loss not exceeding 1%. The recommended cross section is 4mm<sup>2</sup>.
- 3. Withstand ambient temperature;
- 4. Layout type (inside wall, underground, free air etc.);
- 5. UV resistance and so on.

#### **Assembling Procedures**

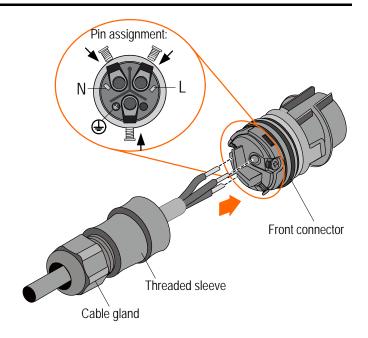
1. Strip off insulation layer of AC cables. The length of strip insulation is about 10mm.



- 2. Insert AC cables through cable gland and threaded sleeve.
- 3. Fix all cables ends to the corresponding terminals with the torque of 1Nm according to markings on the connector, especially "PE" cable.



Observe the pin assignment of AC connector. If a phase wire is connected to the "PE" terminal, it may permanently destroy the inverter.



- 4. Pull cables outwards slightly to confirm whether they are installed firmly.
- 5. Plug the threaded sleeve into the front connector.
- 6. Screw cable gland to the threaded sleeve with tightening torque 2.5Nm.

#### 6.3.3 Connecting Inverter to AC Grid



Make sure that all the DC and AC cables to the inverter are not live before you start the electrical work.

Connect the inverter exclusively to TN or TT mains as the following procedures:

- 1. Disconnect AC circuit breaker and prevent it from reconnection inadvertently.
- 2. Plug AC connector into corresponding AC terminal underneath the inverter.
- 3. Connect "PE" cable to the grounding electrode. Where there are multiple inverters in the PV power system, connect "PE" cables of all inverters and mounting frame of PV arrays to the same copper bus bar, which may establish equipotential connection.
- 4. Connect phase cable and "N" cable to the AC circuit breaker.
- 5. Check whether cables are firmly secured.



No consuming load may be connected to power supply cables from the inverter to the AC circuit breaker.

In addition, ensure that the ground cable is laid as far away from and not directly in parallel to the power supply cable.



Danger to human life due to high voltage existing inside the inverter! Do not turn on the AC side circuit breaker until all inverter electrical connections have completed.

# 6.4 Connecting Inverter to PV Arrays



#### Lethal voltage exists!

PV arrays produce electrical energy when exposed to light and thus can create an electrical shock hazard. Wiring of the PV arrays should only be performed by qualified personnel.

Prior to connecting PV array to inverter, the following specifications of PV arrays should be met:

Туре	DC Power Limit	Open-circuit Voltage Limit	Short-circuit Current Limit
SG2K5TL-31	2.8kW	500V	19A
SG3KTL-31	3.3kW	500V	23A
SG4KTL-31	4.4kW	500V	25A



There is a risk of inverter damage! Exceeding the above specification requirements will cancel any and all warranty and liability claims.

The three PV strings connected to inverter should also meet the following requirements:

- The same number of PV modules in each PV string
- The same type of PV modules
- The identical inclination angle of all PV modules
- The identical azimuth angle of all PV modules

# 6.4.1 Assembling DC Cable to Connector

DC cables from PV strings should be equipped with DC connectors. Pairs of DC connectors are supplied in the scope of delivery.



To maintain IP65 weatherproof function of inverter, only the supplied DC connectors or the connectors of the same protection class can be used.

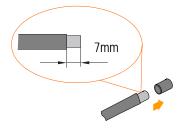
#### **DC Cable Requirements**

Cross-section Area Range	Max. Withstand Voltage	Max. Withstand Current	
2.5~4mm <sup>2</sup>	500V	Same with short-circuit current	

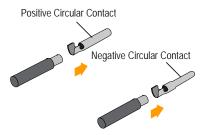
The positive and negative connectors, marked with polarity symbols will be assembled with colored cables as the following procedures:

#### **Assembling Procedures**

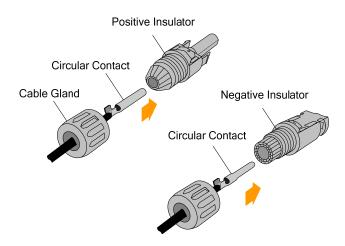
1: Strip off 7mm insulation layer from all DC cables.



2. Crimp cable ends into corresponding circular contacts with crimping pliers.



- 3. Lead cable through cable gland.
- 4. Insert the crimped-on circular contact into insulator until it snaps into place. And pull gently to check that it is correctly engaged.



5. Screw the cable gland to front insulator with tightening torque 2 Nm.

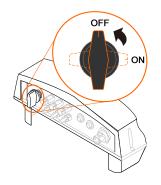
#### 6.4.2 Wiring Procedures



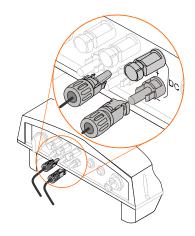
Make sure that all the DC and AC cables to the inverter are no live before you start the electrical work.

Connect the inverter to PV array as the following procedures:

1. Manually rotate the DC switch at the bottom to the "OFF" position.



- 2. Check the connection cable of PV string for the correct polarity and that the short circuit voltage does not exceed inverter input limit 500V, even under the lowest operating temperature. Refer to module specification supplied by module manufacturer.
- 3. Measure the DC voltage between the positive terminal of the PV string and Earth and the DC voltage between the negative terminal of the PV string and Earth. If the two voltages are constant and not zero, there is an insulation failure somewhere in this PV string. Solve the insulation failure if required.
- 4. Plug the positive and negative DC connectors into corresponding terminals until there is an audible sound.



5. Connect other two PV strings in the same procedures if necessary. Unused DC terminals should be sealed.

# 6.5 PV System Grounding



Because of the transformer-less design of the inverter, neither the DC positive pole nor DC negative pole of the PV strings can be grounded.

All non-current carrying exposed metal parts of the equipment and other enclosures in the PV power system should be grounded (e.g., PV arrays frame and inverter enclosure).

Where there is only one inverter in the PV power system, connect "PE" cable to the installation ground.

Where there are multiple inverters in the PV power system, connect "PE" cables of all inverters and mounting frame of PV arrays to the same copper bus bar. In this way, they are in equipotential connection.

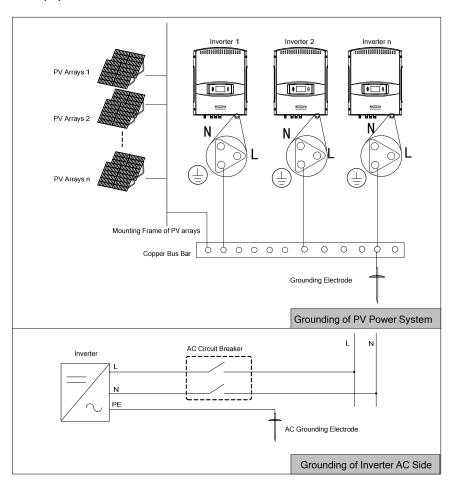


Fig 6-3 PV Power System Grounding

#### 6.6 Communication Connection

#### 6.6.1 Communication Types

Inverter may transfer the monitored information from inverter via its integrated RS485 interface to a PC with monitoring software (such as SolarInfo Insight), or to data logging device (such as SolarInfo Logger).

- Where there is only one inverter, a RS485 cable with RJ45 connector enables connection between inverter and PC.
- Where there is more than one inverter, all inverters can be connected to PC in daisy chain. The first inverter in the chain must be terminated with a resistor of 120 Ohm. And shielding layer of RS485 cable should be single-point grounded.
- A converter such as RS485-232 converter or SolarInfo Logger, which converts 485 to 232 signal, is needed between inverter and PC.

#### 6.6.2 RS485 Communication Connection

RS485 is the standard communication choice for inverter.

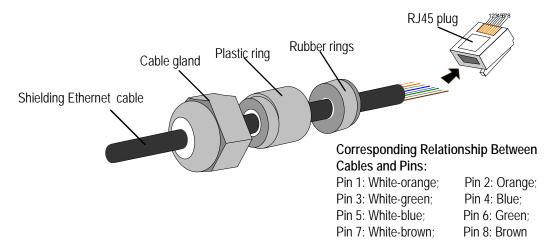
The maximum number that inverters are connected in the daisy chain depends on converter and other factors. Please refer to converter's manual to obtain the limit.

RS485 terminals on the bottom of the inverter are RJ45 sockets. First prepare communication cable and RJ45 plug. Meanwhile to guarantee inverter protection degree, there are waterproof communication connectors supplied in the scope of delivery.

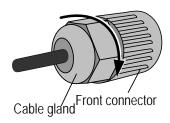


RS485 cable' requirements to ensure quality of communication:

- Shielding Ethernet cable
- Twist-pair type
- 1. Lead shielding Ethernet cable through cable gland and inner rings.
- 2. Use the Ethernet crimper to crimp the cables and connect cables to RJ45 plug according to TIA/EIA 568B.



- 3. Pull cables outwards to confirm whether they are fastened firmly.
- 4. Insert the RJ45 plug into the front plug connector until it makes a clicking sound.
- 5. Tighten the cable gland with appropriate torque.



- 6. Now perform RS485 communication connection as the diagram shown below.
  - Connect connector of one cable end to RS485 terminal on the bottom of the inverter. Make connector and RS485 terminal engage and rotate clockwise about 60 degrees.
  - Connect the other end of cable to other devices. Communication terminal definition is referred to device manual.



Fig 6-4 One Inverter Connected to PC or SolarInfo Logger

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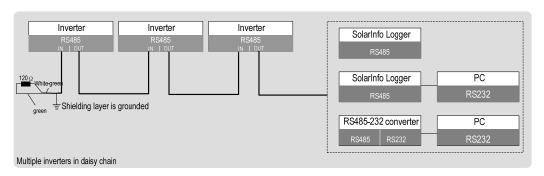


Fig 6-5 Multiple Inverters Communication with Other Devices

7. Verify the communication connection and configure communication parameters.



If there is more than one inverter to communicate with a PC or a data logger, it is crucial to configure communication parameters of each inverter. See "10.16 Communication Parameters Settings".

SolarInfo logger and RS485-232 converter are optional parts and can be ordered from Sungrow.

# 7

# Commissioning

# 7.1 Verify before Commissioning

Before starting up the inverter, you should check the following items for requirements.

- 1. Inverter unit is accessible for operation, maintenance and service.
- 2. Re-check that the inverter is firmly installed on to the wall.
- 3. Room for ventilation well is provided for one inverter or more than one inverter.
- 4. There is nothing left on top of the inverter heat sinker.
- 5. Inverter and accessories are correctly connected.
- 6. Cables are routed in safe place or protected against mechanical damage.
- 7. Specification of AC circuit breaker is reasonable.
- 8. Terminals not used underneath the inverter are sealed.
- 9. Warning signs & labels suitably affixed and durable.

# 7.2 Commissioning Procedures

- 1. Make sure all items above meet demands.
- 2. Close external AC circuit breaker.
- 3. Rotate DC switch to the "ON" position.

Provided that there is sufficient sunlight:

- PV arrays initialize and supply DC power to inverter;

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- DC bus starts to charge and check the state of utility grid;
- If the conditions are OK, inverter feeds AC power to grid and enters into the running state.
- 4. Observe state of LED indicators and LCD screen.



If inverter's commissioning fails, "FAULT" indicator will be lit. And "State" on the LCD screen will display type of malfunction. In this case malfunction must be removed and then repeat 1 to 4.

If inverter's commissioning succeeds, "RUN" indicator will be lit. " on the LCD screen will display "RUN".

# 8

# Disconnection of Inverter

For maintenance work or any service work, inverter must be switched off. In normal operation, switching off is not necessary.

In order to disconnect the inverter from the AC and DC power sources, you should proceed with the following procedures. Otherwise you will be exposed to lethal voltages or the inverter will be damaged.

- 1: Disconnect the external AC circuit breaker and prevent it from connecting again.
- 2: Rotate the DC switch to the "OFF" position.



Please strictly follow the sequence of the above procedures. Otherwise it will lead to unrecoverable inverter damage.

- 3: Wait about ten minutes until the capacitors inside the inverter have discharged.
- 4: Measure to confirm AC output of inverter at the AC circuit breaker is voltage free.
- 5: Pull AC connector out of the inverter.
- 6: Release the locking part of DC connectors by pressing on the ribbing of the locking hooks with nipper pliers and pull outwards.

# $SG2K5TL/SG3KTL/SG4KTL-31 \quad \mathsf{User} \; \mathsf{Manual}$

Press the ribbing



Pull outwards



Disconnect DC connectors



9

# Troubleshooting

# 9.1 Troubleshooting of LED Indicator

# 9.1.1 Troubleshooting of LED Indicator

Phenomenon	Causes	Troubleshooting
LED indicators and LCD cannot	The polarity of DC cables is opposite.	Disconnect inverter from its dual power supplies.
•	2. The DC input voltage is too slow or there is no DC input	Check the polarity of DC input.  Reconnect DC cables if necessary.
	voltage.	Wait for DC voltage to return to the operating voltage.
		If the phenomenon still exists, contact     Sungrow service dept
"RUN" indicator DC voltage supplied is not and LCD turn on stable.		Wait for DC voltage to return to the operating voltage.
and turn off after a while irregularly		If the phenomenon still exists, contact     Sungrow service dept
"RUN" indicator	There is not sufficient DC	Wait for DC power to recover.
flashes regularly	power.	If the phenomenon still exists, contact     Sungrow service dept
"RUN" indicator goes out	Inverter may be in "standby", "startup" or "key-stop" state.	Wait a while for inverter entering into     "Run" state.
		Perform "start" command in the LCD screen.
		3. If the phenomenon still exists, contact

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Phenomenon	Causes	Troubleshooting
		Sungrow service dept
"Fault" indicator is on	There exists a malfunction that not been cleared off.	Perform troubleshooting in according to fault type in LCD screen. See "9.1.2 Troubleshooting of Faults in LCD Screen".

# 9.1.2 Troubleshooting of Faults in LCD Screen

Fault Code	Cause	Troubleshooting		
Vdc-high	The DC input voltage of the inverter exceeds allowable	Rotate the DC switch to the "OFF" position immediately.		
	threshold.	2. Measure the open circuit voltage of PV string again. Decrease the number of PV modules in the PV string if the voltage measured is not permissible.		
		3. Reconnect the DC cables to the inverter and start up the inverter.		
		4. If the fault still exists, contact Sungrow service dept		
Vac-low	The grid voltage falls below the	Check the voltage of the grid.		
	allowable minimum grid voltage threshold of the installation country.	If the grid voltage exceeds the permissible range of inverter protective parameters (the corresponding voltage)		
Vac-high	The grid voltage exceeds the allowable maximum threshold of the installation country.	range for different countries can be found in Table 10-3), ask utility grid company for solution.		
		3. If the grid voltage is within the permissible range, contact Sungrow service dept		
F-fault	The grid frequency exceeds	Check the frequency of the grid.		
	the permissible range.	2. If the grid frequency exceeds the permissible range of inverter protective parameters(the corresponding frequency range for different countries can be found in Table 10-3), ask utility grid company for solution.		
		3. If the grid voltage is within the permissible range, contact Sungrow service dept		
PM-fault	There may be malfunctions of internal modules of inverter.	Contact Sungrow service dept. for solution.		
No-grid	Grid is not present.	Check whether AC circuit breaker is triggered.		
		2. Check whether AC cables are all firmly		

Fault Code	Cause	Troubleshooting
		connected.
		3. Check whether grid is not on service.
		4. If all conditions are OK and this malfunction still occurs in the LCD screen, contact Sungrow service dept. for solution.
Temp-flt	The ambient temperature	The installation site may not be optimal.
	inverter is too high	2. There may be too much dirt on the fans.
		3. Check that there is abnormal noise of fans. Otherwise please replace broken fan (only for SG4KTL-31).
		There may be something covering heat sink.
		5. If the fault still exists, contact Sungrow service dept
DC inject	DC components of inverter output current is too high	Contact Sungrow service dept. for solution.
Earth-ft	Earth fault happens	Contact Sungrow service dept. for solution.
Samp-ft	There may be malfunction of sample circuit.	Contact Sungrow service dept. for solution.
Bus-high	The Bus voltage exceeds limit.	Restart the inverter through LCD command.
		2. If the fault still exists, contact Sungrow service dept
Bus-low	The Bus voltage is too low.	Restart the inverter through LCD command.
		2. If the fault still exists, contact Sungrow service dept
Com-err	LCD can not communicate with DSP	If this malfunction happens, wait for a while and observe whether fault can be cleared by the inverter itself.
		Perform the command "Stop" in the LCD display.
		Perform the command "Start" to restart the inverter
		4. If the fault still exists, contact Sungrow service dept

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If you have any problems in operating on the inverter, please contact us:

Service hotline: +86 551 532 7834/532 7845

Email: service@sungrow.cn

We need the following information to provide you the best assistance:

- Type of the inverter
- Serial number of the inverter
- Fault code
- Brief description of the fault phenomenon

#### 9.2 Maintenance

Once the inverter is well operated, normally inverter needs no maintenance or calibration. It should be ensured, however, that the heat sink is not covered.

To ensure the functionality of the DC switch, it should be switched on and off (by turning the switch to on and off positions at least ten times) once a year.

## 9.2.1 Cleaning the Cabinet

Clean inverter by means of pressurized air or a soft cloth or a brush. Do not use a water hose, aggressive chemicals, cleaning solvents or strong detergents to clean inverter.

# 9.2.2 Cleaning the Heat Sink

In order to secure proper function and extend inverter service life, it is essential that the free air circulation around the heat sink and the fan(only for SG4KTL-31) at the back of the inverter is not obstructed. If the free air circulation is obstructed, e.g. by dust, this has to be removed.

# 9.2.3 Battery Maintenance

There is a button battery on the inner LCD PCB board. It may need to be serviced when it comes to service life.

**Step 1:** Disconnect the connection of the output and input side.

Step 2: Wait for at least ten minutes.

- **Step 3:** Loose screws of inverter upper lid.
- **Step 4:** Check that there is no voltage existing inside with appropriate test device.
- **Step 5:** Replace the button battery.

The following requests should be obeyed during the battery maintenance.

- Servicing of batteries should be performed or supervised by personnel knowledgeable about batteries and the required precautions.
- When replacing batteries, replace with the same type and number of batteries or battery packs.
- Do not dispose of batteries in a fire. The batteries may explode.
- Do not open or damage batteries. Released electrolyte is harmful to the skin and eyes. It may be toxic.
- A battery can present a risk of electrical shock and high short-circuit current. The following precautions should be observed when working on batteries:
  - Remove watches, rings, or other metal objects.
  - Use tools with insulated handles.
  - Wear rubber gloves and boots.
  - Do not lay tools or metal parts on top of batteries.
  - Disconnect charging source prior to connecting or disconnecting battery terminals.
  - Determine if battery is inadvertently grounded. If inadvertently grounded, remove source from ground. Contact with any part of a grounded battery can result in electrical shock. The likelihood of such shock can be reduced if such grounds are removed during installation and maintenance (applicable to equipment and remote battery supplies not having a grounded supply circuit).

# 10

# Operation of LCD Menu

# 10.1 Description of Button Function

Inverter offers two buttons for the user to look up running information and configure parameters. The two buttons have multiple functions. Users should know the button functions and how to operate before any operation onto inverter.

Table 10-1 Description of Button Function

Name	Operation	Description
"ESC/▼"	Press less than two seconds	Move arrow upwards and downwards in the screen or increase and decrease the setting value. It is referred to as "press ESC" hereinafter.
	Press more than two seconds	Return to parent screen or cancel the command.  It is referred to as "press ▼" hereinafter.
"ENTER/▶"	Press less than two seconds	Move arrow left or right in the screen. It is referred to as "press ▶" hereinafter.
	Press more than two seconds	Enter into sub-screen or confirm the command.  It is referred to as "press ENTER" hereinafter.



The background illumination of LCD screen will go out to save power if there is not button operation in one minute. You can activate it by pressing any button.

## 10.2 Operation Mode of Inverter

#### Stop

The inverter is shut down.

#### Stand-by

Stand-by mode is entered for insufficient input power. During stand-by mode the inverter will wait until the DC voltage recovers to 150V in standby time (set by user, see "10.14 Running Parameters Settings").

#### Startup

The inverter is initializing and synchronizing with the grid.

#### Run

After being energized, the inverter tracks the PV arrays' maximum power point and converts DC power to AC power. This mode is the normal operation mode.

#### Fault

If a fault occurs during operation, the inverter will automatically stop operation, trigger AC relay and display the fault type in the LCD panel with LED "Fault" lit.

Once the fault is removed in recover time (set by user, see "10.14 Running Parameters Settings"), the inverter will automatically resume running.

#### Key-stop

The inverter will stop operation by manual "stop" in LCD menu. This condition needs manually "start" to restart.

#### Com-err

LCD screen can not communicate with DSP. LED indictors are not turned on.

# 10.3 Overview of Complete LCD Menu

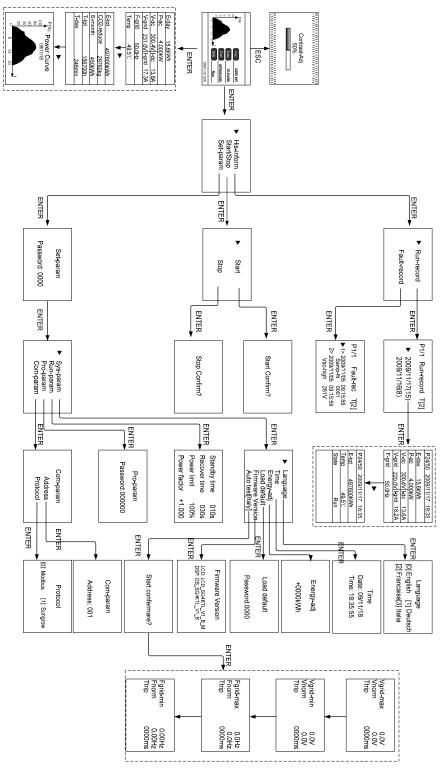
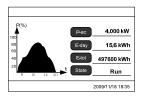


Fig 10-1 Menu Tree

#### 10.4 The Default Screen

The LCD is initialized upon energized of inverter and then enters into the default menu. Current date and time are also displayed.





P-ac: the current output power of inverter.

**E-day:** generated energy in the current day.

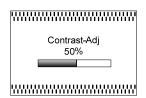
**E-tot:** the overall accumulative generated energy.

State: the inverter's operation mode.

If there is no button operation in two minutes, it will go back to default screen.

# 10.5 Contrast Adjustment

- 1. Press ESC to enter into contrast adjustment screen.
- 2. Press ▼ to increase the setting value and press ► to decrease the value. Contrast value ranges from 0 %( min.) to 100 %( max.).



# 10.6 Current Running Information

- 1. Press ENTER to enter general control screen from the default screen.
- 2. Press ▼ to view current running information. And press ▼ to go to the next page.

E-day	15.6kWh		E-tot	497600kWh	P(%) Power Curve
P-ac	P-ac 4.000kW		CO2-reduce	29760kg	100 09/11/18
V-dc	300.4V I-dc	13.6A	E-month	450kWh	80
V-grid	231.0V I-grid	17.3A	T-tot	156700h	40
F-grid	50.0Hz		T-day	246min	20
Temp	49.5°C				0 8 14 20

V-dc: PV arrays input voltage; I-dc: PV strings input current;

V-grid: Grid voltage; I-grid: Grid current;

**F-grid:** grid frequency; **Temp:** Current ambient temperature;

CO2-reduce: reduced CO2 weight E-month: Accumulative generated energy in

current month;

**T-tot:** Accumulative running time; **T-day:** Running time in current day.

#### 10.7 Historical Information

#### 10.7.1 Running Record

Inverter stores the running information every fifteen minutes during running. User can look up the historical running records following the procedures below.

- 1. Press ENTER to enter general control screen from default screen.
- 2. Press ▼ to navigate arrow-pointer to "His-inform" and press ENTER.
- 3. Press ▼ to navigate arrow-pointer to "Run-record" and then press ENTER.
- 4. Press ▼ to navigate arrow-pointer to the time to look up and press ENTER.
- 5. Press ▼ to move to next screen of the current time. And press ► to go back to last time node. "P8/15": There are running records of 15 pages in total and here is the eighth page.

P8/15	2009/11/17		14:35	P8/15	2009/11/17	14:35
E-day	/ 15.6kWh			E-tot	497600kV	۷h
P-ac	4.000kW			Temp	49.5	°C
V-dc	300.4∨	l-dc	13.6A	State	Run	
V-grid	220.0V	l-grid	18.2A			
F-grid	F-grid 50.0Hz					

#### 10.7.2 Fault Record

Inverter stores up to 20 fault records, which include type and the occurrence time. User can look up the historical fault records following the procedures below.

- 1. Press ENTER to enter general control screen from the default screen.
- 2. Press ▼ to navigate arrow-pointer to "His-inform" and then press ENTER.
- 3. Press ▼ to navigate arrow-pointer to "Fault-record" and then press ENTER.
- 4. Press ▼ to move to next fault record in same page. Press ► to turn pages. "P1/1": There are fault records of one page in total and here is the first page. "T[2]": The total number of fault records is two.

P1/1 Fault-rec T[2]

▶ 2009/11/05 09:15:59
Samp-fit 0001
2009/11/05 09:15:59
Vac-high 261V

Table 10-2 The Explanation of Faults

Fault type	Explanation
Vdc-high	DC voltage is too high
Vac-high	Grid voltage is too high
Vac-low	Grid voltage is too low
lac-high	AC power over-load
F-fault	Grid frequency is abnormal
No-grid	Island or grid is unavailable
PM-fault	Malfunctions of the power module occur
Temp-flt	Temperature inside the enclosure is too high
Earth-ft	There is leakage current in the AC side
Bus-high	The inner DC bus(boost output) voltage is too high
Bus-low	The inner DC bus (boost output)voltage is too low
Samp-ft	The sampling circuit malfunction happens
DC Inject	DC component of output current is too high

## 10.8 Language Settings

Inverter supports four different languages: English, Deutsch, Française and Italia. Language can be configured as the following indications.

- 1. Press ENTER to enter general control screen from the default screen.
- 2. Press ▼ to navigate arrow-pointer to "Set-param" and then press ENTER.
- 3. Press ▶ to move cursor to the right and press button ▼ to set password 1111.
- 4. Press ENTER to confirm command.
- 5. Press ▼ to navigate arrow-pointer to "Sys-param" and then press ENTER.
- 6. Press ▼ to navigate arrow-pointer to "Language" and then press ENTER.
- 7. Press ▼ to navigate cursor to select the number that represents language. And press ENTER to confirm the selection.

Language [0]English [1]Deutsch [2]Française [3]Italia

## 10.9 Time Settings

If there is deviation between the time in the default screen and your local time, you should perform time settings as they will directly affect data record.

- 1. Press ENTER to enter general control screen from the default screen.
- 2. Press ▼ to navigate arrow-pointer to "Set-param" and then press ENTER.
- 3. Press ▶ to move cursor to the right and press button ▼ to set password 1111.
- 4. Press ENTER to confirm command.
- 5. Press ▼ to navigate arrow-pointer to "Sys-param" and then press ENTER.
- 6. Press ▼ to navigate arrow-pointer to "Time" and then press ENTER.
- 7. Press ▶ to move right and press ▼ to set the correct time. Press ENTER after finish settings.

Time

Date: 09/11/18 Time: 18:35:55

# 10.10 Deviation of E-tot Adjustment

Where there is deviation between E-tot in the inverter LCD screen and energy recorded in the energy metering device, you should perform energy-adj settings as the following indications.

- 1. Press ENTER to enter general control screen from the default screen.
- 2. Press ▼ to navigate arrow-pointer to "Set-param" and then press ENTER.
- 3. Press ▶ to move cursor to the right and press button ▼ to set password 1111.
- 4. Press ENTER to confirm command.
- 5. Press ▼ to navigate arrow-pointer to "Sys-param" and then press ENTER.
- 6. Press ▼ to navigate arrow-pointer to "Energy-adj" and then press ENTER.
- 7. Press ▶ to move right and press ▼ to set off-set value. Press ENTER to confirm the settings.

Energy-adj

+0000kWh



The positive symbol "+" can also be changed to negative symbol "-". The adjustable range is from -9999~+9999 kWh.

(Energy-adj value)= (Real measured value)-(E-tot reading value).

# 10.11 Load Default Settings



If "Load default" is performed, all running information and historical records will unrecoverable cleared off. And all parameters not including protective parameters and time will return to the default values.

- 1. Press ENTER to enter general control screen from the default screen.
- 2. Press ▼ to navigate arrow-pointer to "Set-param" and then press ENTER.
- 3. Press ▶ to move cursor to the right and press button ▼ to set password 1111. And press ENTER to enter into parameters settings.
- 4. Press ▼ to navigate arrow-pointer to "Sys-param" and then press ENTER.
- 5. Press ▼ to navigate arrow-pointer to "Load default" and then press ENTER.
- 6. Press ▶ to move right and press ▼ to input the password 1111.

7 Inverter will begin to return to the factory value after pressing ENTER.

Load default Password:0000

### 10.12 Firmware Version

- 1. Press ENTER to enter general control screen from the default screen.
- 2. Press ▼ to navigate arrow-pointer to "Set-param" and then press ENTER.
- 3. Press ▶ to move cursor to the right and press button ▼ to set password 1111. And press ENTER to enter into parameters settings.
- 4. Press ▼ to navigate arrow-pointer to "Sys-param" and then press ENTER.
- 5. Press ▼ to navigate arrow-pointer to "Firmware Version" and then press ENTER to get the version information.

Firmware Version

LCD: LCD\_SG4KTL\_V1\_B\_M

DSP: DSP\_SG4KTL\_V1\_B

# 10.13 Auto-test (Only for Italy)

Inverter provides for Italian auto-test operation to verify the validity of functions about over-voltage protection, under-voltage protection, over-frequency protection and under-frequency protection.

After confirming "Auto test [Italy]" command, the inverter will perform protection functions test automatically in turn. Finally the results will come out.

- 1. Press ENTER to enter general control screen.
- 2. Press ▼ to navigate arrow-pointer to "Set-param" and then press ENTER.
- 3. Press ▶ to move cursor to the right and press button ▼ to set password 1111.
- 4. Press ENTER to confirm command.
- 5. Press ▼ to navigate arrow-pointer to "Sys-param" and then press ENTER.
- 6. Press ▼ to navigate arrow-pointer to "Auto test [Italy]" and then press ENTER. Inverter will start to auto testing.

Vgrid-max 0.0V	Vgrid-min	0.0V	Fgrid-max	0.0Hz	Fgrid-min	0.00Hz
Vnorm 0.0V	Vnorm	0.0V	Fnorm	0.0Hz	Fnorm	0.00Hz
Ttrip 0000ms	Ttrip	0000ms	Ttrip	0000ms	Ttrip	0000ms



Vgrid-max: the maximum threshold of allowable grid voltage;

Vgrid-min: the minimum threshold of allowable grid voltage;

Fgrid-max: the maximum threshold of allowable grid frequency;

Fgrid-min: the minimum threshold of allowable grid frequency;

Vnorm: current grid voltage; Fnorm: current grid frequency;

Ttrip: time interval from current grid state exceeding allowable ranges to inverter disconnecting from grid.

If four different values of "Ttrip" meet the corresponding standards, protective functions of inverter are valid.

## 10.14 Running Parameters Settings

- 1. Press ENTER to enter general control screen from the default screen.
- 2. Press ▼ to navigate arrow-pointer to "Set-param" and then press ENTER.
- 3. Press ▶ to move cursor to the right and press button ▼ to set password 1111.
- 4. Press ENTER to confirm command.
- 5. Press ▼ to navigate arrow-pointer to "Run-param" and then press ENTER.
- 6. Press ▶ to move right and press ▼ to configure running parameters.

Standby time 010s
Recover time 030s
Power limit 100%
Power factor +1.000



"Standby time" is the time from inverter starting to initialize to inverter feeding power to grid. This parameter ranges from 10s to 255s. And the default value is 10s.

"Recover time" is the time from the point that the fault is cleared to inverter recovering to feed power to grid. It ranges from 30s to 300s. And the default value is 30s.

"Power limit" ranges from 0 to 100%.

# 10.15 Protective Parameters Settings

These protective parameters are designed for the limit value that can trigger the protective functions of the inverter.

In order to ensure realization of protective function, these protective parameters have been configured before delivery according to different countries grid requirements. There is password only for installer to configure parameters and the password can be acquired from Sungrow.

- 1. Press ENTER to enter general control screen from the default screen.
- 2. Press ▼ to navigate arrow-pointer to "Set-param" and then press ENTER.
- 3. Press ▶ to move cursor to the right and press button ▼ to set password 1111.
- 4. Press ENTER to confirm command.
- 5. Press ▼ to navigate arrow-pointer to "Pro-param" and then press ENTER.

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- 6. Input the password that be acquired from Sungrow.
- 7. Choose the corresponding country code of the inverter installation country. If the inverter installation site is not included in the following list, installer should choose item "Other" and manually set corresponding protective parameters according to the following table.

Country	y setting
[0] GB	[1] DE
[2] FR	[3] IT
[4] ES	[5] AT
[6] AU	[7] CZ
[8] BE	[9] Other

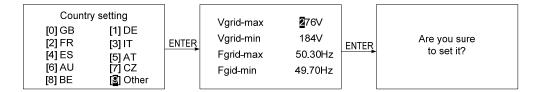
Table 10-3 Range of Protective Parameters

Code	Full Name	Vgrid-max	Vgrid-min	Fgrid-max	Fgrid-min
GB	Great Britain	SG2K5TL-31, SG3KTL-31			
		260V	210V	50.4Hz	47.1Hz
SG4KTL-31					
		264V	184V	52.0Hz	47.0Hz
DE	Deutschland	264V	184V	51.5V	47.5Hz
FR	France	264V	184V	50.2Hz	47.5Hz
IT	Italia	276V	184V	50.3Hz	49.7Hz
ES	Espaňa	253V	195.5V	51.0Hz	48.0Hz
AT	Austria	253V	195V	51.0Hz	47.0Hz
AU	Australia	260V	210V	51.0Hz	49.0Hz
CZ	Czech	264V	195.5V	50.5Hz	49.5Hz
BE	Belgium	264V	196V	51.5Hz	47.5Hz
Other		230V~276V	184V~230V	50Hz~53Hz	47~50Hz
		Default: 264V	Default: 184V	Default:51.5Hz	Default:47.5Hz
				60Hz~63Hz	57Hz~60Hz
				Default: 61.5Hz	Default: 57.5Hz

If the inverter installation country is not included in, installer should choose "Other" and set corresponding protective parameters according to the inverter installation country requirement, not exceeding ranges in the above table.

1: Press ▶ to move arrow to item "Other" and press button ENTER to confirm selection.

- 2: Press ▶ to move cursor and Press ▼ to select values. press button ENTER to confirm value settings.
- 3: Press button ENTER to confirm protective parameters settings.



# 10.16 Communication Parameters Settings

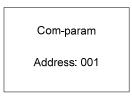
If there is more than one inverter to communicate with a PC or a data logger, it is crucial to configure communication parameters of each inverter.

You can set address for inverters and choose the communication protocol as the following indications. The default protocol is Modbus protocol.

If there are several inverters to communicate with a PC or a data logger, address of every inverter should be different with each other and the default baud rate 9600 of every inverter is identical.

#### 10.16.1 Address Settings

- 1. Press ENTER to enter general control screen from the default screen.
- 2. Press ▼ to navigate arrow-pointer to "Set-param" and then press ENTER.
- 3. Press ▶ to move cursor to the right and press button ▼ to set password 1111. Press ENTER to enter into parameters settings.
- 4. Press ▼ to navigate arrow-pointer to "Com-param" and then press ENTER.
- 5. Press ▼ to navigate arrow-pointer to "Address" and press ENTER.
- 6. Press ▶ to move right and press button ▼ to set address. Press ENTER to confirm.

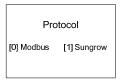




The range of communication address is 1~247. And the baud rate of serial communication is 9600.

#### 10.16.2 Protocol Settings

- 1. Press ENTER to enter general control screen.
- 2. Press ▼ to navigate arrow-pointer to "Set-param" and then press ENTER.
- 3. Press ▶ to move cursor to the right and press button ▼ to set password 1111. Press ENTER to enter into parameters settings.
- 4. Press ▼ to navigate arrow-pointer to "Com-param" and then press ENTER.
- 5. Press ▼ to navigate arrow-pointer to "Protocol" and press ENTER.
- 6. Press button ▼ to set appropriate communication protocol. Press ENTER to confirm.



## 10.17 Inverter Start and Stop

#### Starting the Inverter

- 1. Press ENTER to enter general control screen.
- 2. Press ▼ to navigate arrow-pointer to "Start/Stop" and then press ENTER.
- 3. Press ▼ to navigate arrow-pointer to "Start" and then press ENTER to start inverter.



# **Stopping the Inverter**

- 1. Press ENTER to enter general control screen.
- 2. Press ▼ to navigate arrow-pointer to "Start/Stop" and then press ENTER.
- 3. Press ▼ to navigate arrow-pointer to "Stop" and then press ENTER to stop inverter.



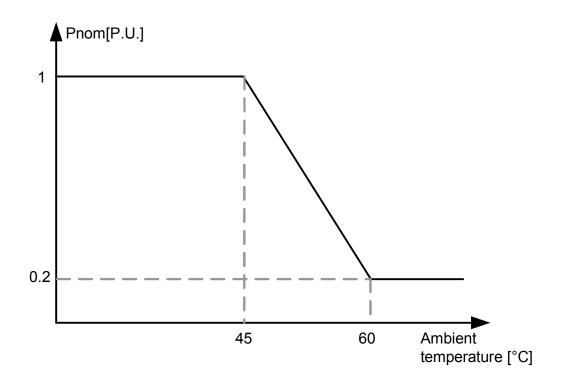
# **APPENDIX**

# **Electrical Specifications**

Technical Specifications	SG2K5TL-31	SG3KTL-31	SG4KTL-31
DC SIDE DATA			
Max. Input Power	2800W	3300W	4400W
Max. Input Current	15A	18A	20A
Isc PV	19A	23A	25A
MPP Voltage Range	180~400V	180~400V	210~400V
Max. Input Voltage	500V		
Min. Input Voltage	150V		
Start Voltage	170V		
Number of MPP Trackers/Strings Per MPP Tracker	1/3		
AC SIDE DATA			
Nominal AC Power	2500W	3000W	4000W
Max. Output Current	12A	14A	19A
Rated Output Voltage	230Vac		
Output Voltage Range	184~276Vac		
Rated Output Frequency	50Hz/60Hz		
Output Frequency Range	47Hz~53Hz/57Hz~63Hz		
Output Current THD	<3% (at nominal power)		
DC Current Injection	<0.5% of rated inverter output current		
Power Factor	≥0.99 (at nominal power)		

System				
Max. Efficiency	97.3%			
Euro. Efficiency	96% 96.2% 9		96.3%	
Enclosure	IP65 Fans: IP54; Other: IP65			
Power Consumption at Night	0W			
Ambient Temperature	-25℃~+60℃			
Safety Class	I			
PV Side Overvoltage Category	II			
AC Side Overvoltage Category	III			
Wet Location	Yes			
Pollution Degree	3			
Cooling Method	force		controlled forced-air cooling	
Relative Humidity	0~95%, non-condensing			
Max. Working Altitude	2000m			
DC Switch	Optional			
Mechanical DATA				
Dimensions(W x H x D)	420x555 x179 mm			
Weight	20kg			
DISPLAY AND COMMUNICATION				
Display	LCD			
Communication(Standard)	RS485			
Communication(Optional)	Ethernet			

# Temperature Derating Curve



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- Ignoring safety warnings and instructions contained in all documents relevant to the product
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- Altering the product or supplied software without authority
- The product malfunctions due to operating attached or neighboring devices beyond allowed limit values
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Sungrow power supply is a China-leading manufacturer of various power electronics products for renewable energy generation systems. Our products include converters, inverters, battery chargers and other power supplies for distributable generation system in both grid-connected and stand-alone applications. The power rating of Sungrow products covers from several hundred watt to large mega-watt systems.

The pursuit of Sungrow is to help our customers acquire stable and clean power with minimum cost, maximum reliability and enhanced safety.

#### Contact Information

If you have any questions about this product, our hotline will be happy to assist you. Please keep the following data when contacting Sungrow.

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